Erroneous Accounting and Industry Investment Efficiency: Evidence from Restatements

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November 29, 2006

Abstract

This study documents that restatements of previously published financial statements by U.S. firms are associated with a significant decrease in value for their competitor firms. In contrast to the established contagion explanation, the drop in value occurs because competitors condition their investments on financial statements that are revealed, ex post, to be erroneous. Controlling for the contagion effect, competitors are found to experience a larger decrease in value if they made more inefficient investments in the past. Furthermore, investment allocation is less efficient in industries with more restatements and the inefficiency arises mainly because of over-investment. The value decrease is also larger for competitors of restating firms with a greater market share and for competitors whose industry definition is closer to the industry definition of restating firms.

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1 Introduction

Published financial statements are restated when they are discovered not to be consistent with the Generally Accepted Accounting Principles (GAAP). At the announcement of restatements, firms experience negative stock price reaction (Palmrose et al. (2004)). Recent evidence suggests that losses in share value are not limited to restating firms but also occur for their competitors due to contagion (Gleason et al., 2004; Xu et al., 2006). Contagion occurs if restatements signal that financial statements in the entire industry are more erroneous than previously expected.

The current study argues that the adverse effect of restatements goes beyond competitors' financial statements. Specifically, the present paper contends that a restatement by one company send a signal about the quality of competitors' past investments. Firms condition their investments on information about other companies in their industry. This information can be gathered from various sources, including financial statements. For instance, a firm can determine from the financial statements of another company in its industry whether this company has a growing asset base. If financial statements of a company turn out to have been erroneous and need to be restated, then the competitors of that company based their past investments on erroneous information. Investments based on erroneous information likely deviate from their value-maximizing level and are inefficient. Consequently, when restatements are announced, competitors of restating firms experience negative share price reaction.

To test this hypothesis, this study examines the competitors of 713 firms that announce restatements between 1997 and 2002. Consistent with the extant literature, the present paper finds that competitors experience value losses during the restatement announcement. For instance, competitors in the same 4-digit SIC industry as the restating firms have significantly negative mean abnormal returns of −0.34% during the three days surrounding the restatement announcement (Figure 1A). These average announcement returns are economically smaller than those of restating firms, which experience cumulative abnormal returns of about −9.2% (Palmrose et al., 2004). However, there are substantially more competitors than restating firms. Specifically, the 713 restating firms have 8,500 competitors in the same 4-digit SIC industry between 1997 and 2002. On an aggregate level, these competitors lose $581 million in market value during the three days surrounding the restatement announcement. On the other hand, restating firms lose about a fourth less on aggregate, $141 million (Figure 1B).

Unlike the existing literature, the present study links competitors' wealth losses to the efficiency of their past investments. Competitors' investment inefficiency is measured using the methodology in Durnev et al. (2004) and Ferreira and Laux (2006) as the industry level deviation of Tobin's marginal q from its optimal level. The evidence shows that competitors of restating firms do not invest efficiently. Consistent with the main hypothesis, the competitors experience larger decline in value when their marginal qs are further away from their optimal levels, that is, when investment quality is lower.

The study extends its analysis in various ways to provide additional support for its main hypothesis. In industries with more restatements, the quantity of information revealed ex post to have been erroneous is larger. Competitors in such industries thus turn out to have used a large quantity of erroneous information when making their investments. This study therefore hypothesizes that investments are more inefficient in industries with more restatements. The evidence is consistent with this prediction, and shows that the deviation of marginal q from its optimal level increases with the number of restatements.

Second, the impact of the restating firms' market share is analyzed. Companies with a larger market share are more closely observed by their competitors, because a firm's relevance in its industry rises. Hence the abnormal returns of competitors are expected to be lower as the market share of restating firms increases. The evidence supports this prediction.

Third, the definition of competitors is broadened from the 4-digit SIC level to the 3-digit and the 2-digit SIC level. Competitors find financial statement information more relevant for their investments if this information stems from firms in the same 4-digit industry rather than from firms in the same 3-digit or 2-digit industry, since the latter firms are more different from each other. Hence, as the industry definition is widened, competitors experience less negative abnormal announcement day returns.

This study extends the accounting and finance literature in three ways. First, it adds to the literature on accounting restatements, which shows that competitors of restating firms experience significantly negative abnormal returns around the restatement announcement (Gleason et al., 2004; Xu et al., 2006). The present study is the first to argue and to document that the competitors' losses in value are related to the inefficiency of their past investments.

The paper is related to Sadka (2006), who examines the effect of fraudulent firms' financial reporting on the output and pricing decisions in their industry. In his model, fraudulent firms make pricing and output decisions consistent with their fraudulent financial reporting, which leads their competitors to deviate from their profit-maximizing strategies. Unlike in Sadka (2006), the current study links competitors' investment inefficiency directly to the wealth losses that competitors experience around restatement announcements. The present paper is the first to provide evidence of a relation between competitors' wealth losses and their investment inefficiencies.

Second, the current paper extends the literature on the relation between financial reporting and real decisions. A large body of work analyzes the real incentives that drive earnings management. For instance, earnings can be managed for the managers' private gain (Chen and Warfield, 2005; Burns and Kedia, 2006; Bergstresser and Philippon, 2006). However, few studies examine the effects of financial reporting on real decisions. These papers focus on how firms use real decisions to manage earnings (Roychowdhury, 2005; Gunny, 2005). For example, Roychowdhury (2005) documents that firms grant temporary price discount to increase sales. The present study extends this literature by showing that financial reporting affects not only the real decisions of firms that make the original financial reporting choices, but also the real decisions of other companies.

Third, this paper contributes to the literature on governance, the quality of information and the efficiency of capital allocation. More informative stock prices are associated with higher quality capital budgeting decisions (Durnev et al., 2004; Chen et al., 2006). Furthermore, Ferreira and Laux (2006) find that higher governance quality is associated with better allocation of capital. The present study investigates a measure of information quality other than the informativeness of stock prices or corporate governance, namely errors in published financial statements. The findings indicate that such errors affect competitors in the industry by lowering the efficiency of their investments.

The evidence in this paper has policy implications regarding the usefulness of corporate governance reforms in general, and the Sarbanes-Oxley Act in particular. The professional and academic literature has been intensely debating the costs of complying with the Sarbanes-Oxley Act and its benefits, such curbing corporate misdeeds, and increasing disclosure (Jain et al., 2004; Durnev and Kim, 2004; Zhang, 2005; Litvak, 2006). The results in the present study suggest that in order to fully evaluate the merits of corporate governance reforms, one has to consider not only companies directly affected by such reforms, but also their competitors.

The rest of this paper is organized as follows. Section 2 reviews the literature and develops the hypotheses. Section 3 presents the data. Section 4 discusses the main findings. Section 5 discusses alternative explanations. Section 6 concludes.

2 Hypotheses Development

The economic literature indicates that firms take into account information about their competitors when making investment decisions (Dixit and Pindyck, 1994). As a simple example, consider a firm that invests in the production of computer equipment. The investment's future cash flows depend on the price at which the computer equipment can be sold. The price is affected by how quickly its competitors introduce improved computer equipment making the existing technology obsolete. Furthermore, a firm's ability to expand capacity may be restricted because of limited resources, the need of licences and other industry-wide capacity constraints (Abel et al., 1995; Dixit and Pindyck, 1998).

Firms can obtain information about their competitors from various sources, such as announcements in press, industry reports, or published financial statements. Consistent with this argument, the accounting literature suggests that concerns about propriety information affect disclosure decisions in financial statements (Verrecchia, 2001). Even if financial statements do not contain any proprietary information, they can still be informative about competitors. For example, R&D expenses can provide information about expansion in firm's R&D program. Accumulated depreciation can be informative about the firm's replacement of long-lived assets. More recent literature in fact establishes a link between firms' financial reporting and their competitors' investment policies (Admati and Pfleiderer, 2000; Sadka, 2006).

Information in published financial statements is subject to a firm's reporting choices. Evidence in the accounting literature indicates that firms engage in earnings management (Coles et al. (2006) and Fields et al. (2001)). When published financial statements are not consistent with GAAP and contain inaccurate, incorrect or misleading information, companies have to correct the original false statements and file restated financial statements (Skinner, 1997).[1] Restatements are relatively infrequent, but have been increasing in recent years (Figure 1A).

The above discussion suggests that firms' investment decisions are at least partly based on information from their competitors' financial statements. These decisions then likely turn out to be inefficient ex post once the competitors' financial statements are revealed to

[1]Once a firm detects an accounting error made previously, it has to disclose both the nature of the error and the effect of its correction (if material) on income before extraordinary items, net income, and related per share amounts. The correction of the prior error implies a "prior period adjustment" to the beginning balance in retained earnings, as well as a restatement of the firms previously issued financial statements.

have been erroneous at the time when the investments were made. Hence, competitors of restating firms likely experience a drop in share prices at the restatement announcement. If the drop occurs because competitors' past investments are revealed to be inefficient, then the competitors abnormal returns are expected to be related to the degree of inefficiency of their past investments. As the inefficiency revealed at the restatement announcement rises, competitors' abnormal returns are expected to fall by more.

This prediction assumes that restatements are not fully anticipated, neither by investors nor by competitors at the time when competitors invest. Some support for this assumption can be found in the accounting literature. Financial analysts, for instance, react to restatement news rather than anticipating them (Griffin, 2002). Furthermore, institutional investors do not appear to fully anticipate restatements either (Griffin, 2002; Hribar et al., 2004). Finally, the only group of investors able to predict restatements are insiders and shortsellers (Dechow et al., 1996; Desai et al., 2002; Griffin, 2002; Efendi et al., 2005). Hence the first testable hypothesis links the size of competitors' abnormal returns to the inefficiency of their past investments.

Hypothesis 1. Competitors of restating firms experience lower abnormal returns around restatements when their past investments are more inefficient.

Firms in some industries restate financial statements more often than in others. For instance, evidence in Palmrose et al. (2004) indicates that the majority of restatements in their sample occurs in the manufacturing industry (36%), followed by the technology industry (26%) and the financial services as well as the services industry (12%). Industries with more restatements have a higher proportion of financial statements that are revealed to have contained errors. When investing, competitors of restating firms have thus used increasingly erroneous information. Consequently, in industries with more restatements, investment quality is expected to be worse. The second hypothesis follows.

Hypothesis 2. Past investments are more inefficient in industries with more restatements.

Not all firms carry the same weight within an industry and competitors observe firms with a larger market shares more closely. Consistent with this, the industrial organization literature suggests that market share is developed through improving firm-specific efficiencies, such as technology innovations or lower production costs. Consequently, firms with higher market shares are more profitable (Demsetz, 1973; Peltzman, 1977; Smirlock, 1985; Nobeako and Cusumano, 1994; Carlton and Peloff, 2000). If competitors increasingly scrutinize other firms' financial statements as the market share of these firms rises, competitors' investments are affected more by financial statements of such firms. In an event of restatement, competitors of firms with larger market shares are expected to experience a greater decline in share prices. The third hypothesis results.

Hypothesis 3. Competitors of restating firms experience lower announcement returns around restatements as the market share of the restating firms rises.

Competitors can be defined on various SIC levels. For instance, Coca Cola, Pepsi and Starbucks are all in the beverage industry. However, Coca Cola and Pepsi are closer competitors than Coca Cola and Starbucks because of the similarity of the products sold by Coca Cola and Pepsi. Coca Cola therefore is affected to a larger extent by information about Pepsi than by information about Starbucks. Competitors on a 4-digit SIC level are more similar to each other than competitors on a 3-digit SIC level or on a 2-digit SIC level. Applied to the industry classification system, this argument implies that competitors on a 4-digit industry level are more likely to take into account information about their peers than competitors on a 3-digit SIC level, or on a 2-digit SIC level. Furthermore, at the 4-digit level, a firm has fewer competitors than at the 3-digit or the 2-digit level. Each competitor thus becomes marginally more pertinent as one moves from the 2-digit level to the 3-digit level and the 4-digit level. The fourth hypothesis obtains.

Hypothesis 4. Competitors of restating firms experience lower announcement returns around restatements when they are defined by 4-digit SIC codes rather than by 3-digit SIC codes, and when they are defined by 3-digit SIC codes rather than by 2-digit SIC codes.

3 Data

3.1 Sample

Table 1 shows the sample selection details. Data on accounting restatements from January 1st, 1997 through June 30th, 2002 are obtained from the General Accounting Office study (General Accounting Office, 2002). The GAO identifies restatements via a keyword search in Lexis Nexis.[2] The GAO focusses only on those restatements that result from accounting irregularities, such as "aggressive" accounting practices, intentional and unintentional misuse of facts applied to financial statements, oversight or misinterpretation of accounting rules, and fraud. Furthermore, the GAO includes all such accounting irregularities, independent of their impact on financial statements. The GAO database contains 916 restatements by 839 firms between 1997 and 2002. After eliminating observations for which information from CRSP or COMPUSTAT is missing, 836 restatements by 785 firms remain. Finally, instances where firms change their fiscal year end during the restatement year are excluded resulting in the final sample of 785 restatements by 713 firms. Figure 1A indicates that the number of restatements rose between 1997 and 2002, consistent with similar evidence in the literature (Palmrose et al., 2004).

The competitors of restating firms are identified by their 4- ,3- , or 2-digit SIC codes. The 785 restatements correspond to 475 industry-years (248 industries) on the 4-digit SIC level, 382 industry-years (176 industries) on the 3-digit SIC level, and 218 industry-years (59 industries) on the 2-digit SIC level. All companies in the same fiscal year and in the same 4-digit (3-digit) [2-digit] industry as a restating firm are retained as competitors for that particular restating firm and restatement announcement date. This procedure results in a final competitor sample of 73,667 firm-years (8,500 firms) on the 4-digit SIC level, 153,733

[2] The GAO uses the Lexis Nexis "Powersearch" command to search the "US News, Combined" database using "restate", "restates", "restated" "restating" or "restatement" within 50 words of "financial statement" or "earnings". The GAO also uses other variations such as "adjust", "amend" and "revise". Finally, the GAO includes some restatements identified through other sources, such as the Securities and Exchange Commission (SEC).

firm-years (9,425 firms) on the 3-digit SIC level and 295,574 firm-years (10,901 firms) on the 2-digit SIC level.

3.2 Announcement day returns

Table 2 shows the mean abnormal returns for competitors (defined by 4-digit SIC industry) around the restatement announcement day, while Figure 1A plots the competitors' mean cumulative abnormal returns by fiscal year. Abnormal returns are market-adjusted returns, using the CRSP equally-weighted market index. The literature indicates that the market-adjusted model has the same ability as other models (market model, CAPM or Fama-French three-factor model) to detect abnormal returns when they are present (Brown and Warner, 1985; Kothari and Warner, 1997). Furthermore, competitor firms are generally associated with more than one restatement announcement date, and such announcement dates are oftentimes no more than two weeks apart. This characteristic of competitor firms implies that it is difficult to estimate CAPM or Fama-French three-factor model parameters out of sample.

Panel A of Table 2 shows that competitors' mean daily abnormal returns are negative around the restatement announcement. For instance on $\tau = 0$, abnormal returns are -0.08%, which is significant at the 1% (10%) level using the Patell (Generalized Sign) Z test. Panel B displays competitors' mean cumulative abnormal returns for various periods $[d - \tau, d + \tau]$ around the restatement announcement date $d = 0$. Mean cumulative abnormal returns are significantly negative during the various periods. For instance, between $[-1, +1]$, mean cumulative abnormal returns are -0.34%, which is significant at the 1% level using both the Patell Z and the Generalized Sign Z. This translates into an aggregate loss of about 581 million U.S. dollars.[3]

To put this loss into perspective, the wealth loss for restating companies is examined.

[3]The 581 million dollar loss is obtained by multiplying the market value of each competitor at the beginning of $d-1$ with the abnormal return of that competitor between $d-1$ and $d+1$. The resulting dollar change in the market value per competitor is then summed across all the competitors in the sample.

The restating firms in the current study experience average cumulative abnormal returns of −8.28%, which is consistent with the literature (Palmrose et al., 2004). This translates into an aggregate loss of about 141 million U.S. dollars. Hence the aggregate loss in market value is about three times larger for competitors of restating firms than for the restating firms themselves. As Figure 2 indicates, competitors experience a larger aggregate loss than restating firms for every year between 1997 and 2002, except for 1998.

4 Main Results

4.1 Abnormal returns and investment inefficiency

This section tests Hypothesis 1, which predicts that competitors of restating firms experience lower abnormal returns when the market learns that their past investment decisions were inefficient. Following Durnev et al. (2004) and Ferreira and Laux (2006), the proxy for investment inefficiency is based on Tobin's marginal q. The marginal q, $MQ_{k,t}$, is estimated for each 4-digit SIC industry k and year t between 1996 and 2001, as detailed in Appendix B. Restating firms are excluded from the computation of the marginal q. This methodology yields 478 marginal qs, $MQ_{k,t}$, based on 25,587 individual firm-year observations. The 1996 to 2001 period is used, rather than the 1997 to 2002 sample period, in order to obtain lagged marginal qs, since the Hypothesis 1 focuses on past investments' efficiency.

In the absence of corporate and dividends taxes, marginal q equals 1 when industry investment is at its value-maximizing level (Durnev et al., 2004).[4] Hence, the deviation of the marginal q from 1 captures the magnitude of industry investment inefficiency. Marginal q lower (higher) than 1 indicates over-investment (under-investment) in the industry. The descriptive statistics in Table 3 points out that the average value for marginal q is 0.771 which corresponds to over-investment.

[4] The sensitivity analysis in Section 6 considers the effects of taxes and other complications on marginal qs estimation.

To relate competitors' abnormal returns to their industry's marginal qs, the following regression is used,

$$CAR_{k,d-\tau,d+\tau} = \beta_1 InvIneff_{k,t-1} + \Gamma\Pi + \varepsilon_{k,t}, \quad (1)$$

where $CAR_{k,d-\tau,d+\tau}$ are cumulative abnormal returns during the period $[d-\tau, d+\tau]$ for competitors i in industry k to which the restating firm j belongs in the fiscal year t of the restatement announcement. They are calculated as follows. First, cumulative market-adjusted returns of each competitor i are computed for $[d-\tau, d+\tau]$. These cumulative abnormal returns are then averaged across all competitors in industry k, and fiscal year t. Cumulative abnormal returns are aggregated onto industry-year levels for two reasons. First, industry aggregates are less affected by noise that can add error to firm-level variables. Second, industry-level variables rather than firm-specific variables facilitate comparison with investment efficiency variable $InvIneff_{k,t-1}$ that can only be constructed on industry levels. The period $[d-\tau, d+\tau]$ ranges either from -1 to $+1$, or from -5 to $+5$.

In (1), $InvIneff_{k,t-1}$ is investment inefficiency in industry k and year $t-1$ (the fiscal year prior to the restatement year t). It is defined as either the absolute value of the deviation of the marginal q in $t-1$ from 1, $|MQ_{k,t-1} - 1|$, or the square of the deviation of the marginal q in $t-1$ from 1, $(MQ_{k,t-1} - 1)^2$. When past investments are more inefficient, both $|MQ_{k,t-1} - 1|$ and $(MQ_{k,t-1} - 1)^2$ are larger. Hence Hypothesis 1 implies that the coefficient β_1 in equation (1) is negative.

The vector Π captures control variables likely to affect competitors' abnormal returns (see, for instance, Palmrose et al. (2004)). These intuition for considering these variables is explained below. The computation of the variables is detailed in Appendix A.

- The Herfindahl index, $Herf_{k,t-1}$, controls for competition. In less competitive industries, a restatement may have a positive effect on competitors, because the demand in the industry can shift from restating firms to their competitors enabling the competitors to raise prices. At the same time, business conditions are less predictable in less competitive industries, which might affect marginal q estimates.

- Smaller firms have a larger stock price reaction to earnings announcements than larger firms (Collins et al., 1987; Freeman, 1987). Hence the size of restating firms, $Size_{j,t-1}$, and of their competitors' industry k, $Size_{k,t-1}$, are included in regression (1).

- Market reactions to earnings news depends on debt levels (Billings, 1999; Core and Schrand, 1999). Thus debt levels of restating firms, $Debt_{j,t-1}$ and of their competitors' industry, $Debt_{k,t-1}$, are controlled for.

- The market reaction to bad news depends on firm performance prior to announcement (Kinney and McDaniel, 1989; Palmrose and Scholz, 2004). To capture performance, buy-and-hold returns over the 120 days preceding the restatement announcement for restating firms, $BH_{j,120}$, and for their competitors' industry, $BH_{k,120}$, are used.

- Industry dummies I_k and fiscal year dummies T_t are included in regression (1) to control for unobservable industry and time effects.

To account for heteroscedasticity, t-statistics of regression coefficients are calculated using robust standard errors. The Pearson correlation coefficients for the variables in regression (1) are displayed in Table 4. The correlations between abnormal returns and the investment inefficiency proxies are negative, although they are not significant. The results from estimating equation (1) are shown in Table 5. Columns (1) and (2) [(3) and (4)] show the findings when abnormal returns are cumulated over the $(-1, +1)$ $[(-5, +5)]$ period. The results when the proxy for investment inefficiency is $|MQ_{k,t-1} - 1|$ $[(MQ_{k,t-1} - 1)^2]$ are presented in columns (1) and (3) [(2) and (4)].

The evidence generally supports Hypothesis 1 and indicates that when marginal qs are further away from one, that is, when past investment decisions are less efficient, competitors' abnormal returns are lower. The coefficient β_1 on $InvIneff_{k,t}$ is negative, and significant at the 1% level in three out of the four regressions in Table 5. For instance, in column (1), which shows the results for abnormal returns cumulated over the (-1,+1) period, and for $|MQ_{k,t} - 1|$ as a proxy for investment inefficiency, the coefficient $\beta_1 = -0.009$ (t-statistic of -2.16). Economically, this finding indicates that when the marginal q moves away from 1 by one standard deviation (which is 0.724 as shown in Table 3), cumulative abnormal returns decline by $0.6\% = 0.724 \times -0.009$. Applied to the aggregate market value of 164 billion of U.S. dollar for $60,069$ competitors on $d-2$, this translates into a loss of about 982 million U.S dollars.

4.2 Investment inefficiency and the number of restatements

4.2.1 Main Results

Hypothesis 2 predicts that as the number of restatements in an industry increases investments are less efficient. Figure 2 displays the annual average measure of investment inefficiency ($|MQ_{k,t} - 1|$) for industries with and without restatements. It is evident that in every year between 1997 and 2002, industries with at least one restatement have marginal qs further away from 1 than industries without restatements. The differences in average values for $|MQ_{k,t} - 1|$ are significant at the 10% level for four out of the six years.

To examine the relation between investment inefficiency and the total number of restatements, the following regression is used,

$$InvIneff_m \quad = \quad \delta_1 Num_n + \Lambda L + \varepsilon_{m,t}, \tag{2}$$

where Num_n is the number of restatements in industry k between 1997 and 2002, that is by industry-period n. There is not much variation in the number of restatements by fiscal year. Hence each the 1997-to-2002 data is pooled to estimate the variables. Variable Num_n can take zero values for industries with no restatements between 1997 and 2002.

The variable $InvIneff_m$ is either $|MQ_m - 1|$ or $(MQ_m - 1)^2$. Marginal qs are calculated by 4-digit SIC industry k during the entire period from 1996 to 2001, that is by industry-period m, as detailed in Appendix B. This methodology yields 224 marginal qs, MQ_m, based on 3,104 individual firm observations. The 1996 to 2001 period rather than the 1997 to 2002 sample period is used because Hypothesis 2 focusses on past investments' inefficiency. Hypothesis 2 implies that the coefficient δ_1 in equation (2) is positive.

The vector L captures control variables likely to affect the investment inefficiency $InvIneff_m$. The computational details are in Appendix A.

- Industry size, $Size_m$, is controlled for, because firms in larger industries may have more internal cash and easier access to externally raised funds that can finance profitable investment projects.

- Diversification, $Divers_m$, may affect investment efficiency through firm governance and access to capital. For example, more diversified firms exhibit less efficient segment investment and higher diversification discounts after divestitures decisions (Dittmar and Shivdasani, 2003). At the same time, more diversified companies are more likely to restate earnings because of governance problems.

- Industry leverage, $Debt_m$, may influence investments. High leverage constrains managers from value destroying decisions (Jensen, 1986). Bankruptcy costs can also distort optimal investment.

- Industry concentration is controlled for by including the Herfindahl index, $Herf_m$. Investment decisions might be less efficient in more concentrated industries because firms in such industries face less competition.

- Liquidity, Liq_m, is included because firms with more cash might overinvest.

- Industries with higher growth options face greater investment uncertainty. Thus industry growth options, M/B_m, are controlled for.

- One-digit industry dummies are included in regression (2), since the control variables may not capture every industry characteristic that can affect the investment inefficiency.[5]

Table 6 shows the Pearson correlation coefficients for the variables in regression (2). The correlation coefficients between the two investment inefficiency proxies, $|MQ_m - 1|$ and $(MQ_m - 1)^2$, and the number of accounting restatements Num_n is significantly positive. The results from estimating equation (2) are displayed in Table 7. Column (1) [column (2)] presents the findings when the investment inefficiency proxy is $|MQ_m - 1|$ [$(MQ_m - 1)^2$]. The evidence in both columns is consistent with Hypothesis 3. The coefficient δ_1 on the number of accounting restatements Num_n is significantly positive. These results indicate that the past marginal qs are further away from 1 when the number of accounting restatements is higher. The signs of the control variables are consistent with Durnev et al. (2004).

4.2.2 Over-investment versus under-investment

Out of total 224 industries in the sample, 145 (65% of the sample) under-invest and 79 (35%) over-invest. The mean (median) value of marginal q is 0.80 (0.74) indicating over-investment, on aggregate. The study next analyzes whether the results in Table 7 are driven by industries that over-invest (marginal qs are lower than 1) or by industries that under-invest (marginal qs are higher than 1). The following regression is considered,

$$InvIneff_m = \delta_0 d_{MQ_m<1} + \delta_1 Num_n + \delta_2 Num_n d_{MQ_m<1} + \Lambda L + \Omega L d_{MQ_m<1} + \varepsilon_{m,t}, \quad (3)$$

where $d_{MQ_m<1}$ is a dummy that equals 1 if the marginal q is strictly lower than 1, and 0 otherwise. All other variables are defined as in regression (2). Coefficient δ_1 captures the relation between the number of restatements Num_n and investment inefficiency $InvIneff_m$ when competitors under-invest and $d_{MQ_m<1} = 0$. Coefficient δ_2 reflects the incremental relation between the number of restatements and investment inefficiency when competitors

[5] The results do not change if industry dummies are defined on a two-digit SIC level.

over-invest and $d_{MQ_m<1} = 1$. If the sensitivity of investment inefficiency with respect to the number of restatements is stronger when competitors over-invest than when they under-invest, then $\delta_3 > 0$, otherwise $\delta_3 < 0$.

The results are presented in Table 8. Column (1) [column (2)] displays the findings when the investment inefficiency proxy is $|MQ_m - 1|$ [$(MQ_m - 1)^2$]. The relation between investment inefficiency and the number of restatements is stronger for industries with over-investment (and marginal qs below 1). For instance, the coefficient δ_2 on the interactive term $Num_n d_{MQ_m<1}$ is significantly positive at 0.032 (t-statistic of 2.19) in column (1). For industries with under-investment (marginal qs above 1), the relation between the investment inefficiency and the number of restatements is lower than for industries with over-investment, albeit it is still positive.

If competitors were financial constrained due to inferior information about restating firms, the results in Tables 7 and 8 would be driven by under-investing industries. In contrast, the above regression results suggest that competitors that rely on erroneous information are not financially constrained, rather they misallocate excess resources and channel them towards inefficient projects. Alternatively, as described in Sadka (2006), firms that inflate accounting numbers also engage in suboptimal investment and pricing strategies. The competitors are then under pressure to keep up with the culprits by spending capital on value-destroying projects. Sadka (2006) provides a careful case study how companies in the U.S. telecom industry engaged in excessive investment and pricing wars prior to the demise of Worldcom.

4.3 Abnormal returns and market share

This section tests Hypothesis 3, which predicts that competitors experience lower abnormal returns when restating firms in their industry have a larger market share. The following empirical specification is used,

$$CAR_{k,d-\tau,d+\tau} = \beta MS_{j,t} + \Gamma\Pi + \varepsilon_{k,t}, \quad (4)$$

where $CAR_{k,d-\tau,d+\tau}$ are defined as in (1) and the period $[d-\tau, d+\tau]$ is either $[d-1, d+1]$, or $[d-5, d+5]$. The variable $MS_{j,t}$ is the market share of restating firm j in industry k in t. The market share is the ratio of sales of the restating firm to the sales of all companies in the restating firm's industry. Hypothesis 4 implies that the coefficient β on $MS_{j,t}$ is negative. Moreover, it is expected that the coefficient significance is lower when industries are defined on the 2-digit level rather than on the 3-digit and 4-digit level. The vector Π captures control variables likely to affect competitors' abnormal returns, and is defined as in Section 4.1.

The results are shown in Table 9, for two cumulation horizons for abnormal returns, $[-1, +1]$ in columns (1), (2), and (3), and $[-5, +5]$ in columns (3), (4), and (5). Competitors are defined on the 4-digit SIC level (columns (1) and (4)), the 3-digit SIC level (columns (2) and (5)), and the 2-digit SIC level (columns (3) and (6)). The results generally support the hypothesis that competitors experience lower abnormal returns when restating firms have a larger market share. The coefficient β on the market share variable, $MS_{j,t}$, is negative and significant for 4-digit and 3-digit industry specifications. For instance, in column (1), $\beta = -0.068$ (t-statistic of -3.08). This result suggests that when the market share of restating firm j in industry k increases by one standard deviation (which is 12% as shown in Table 3), competitors' cumulative abnormal returns decrease by $0.82\% = 0.12 \times -0.068$ on average. Applied to the competitors' aggregate market value of 164 billion U.S. dollars on $d-2$, this translates into an aggregate loss of about 1.3 billion U.S. dollars. When competitors are defined on 2-digit industry level, as expected, $MS_{j,t}$ loses significance.

4.4 Abnormal returns across SIC levels

Table 10 provides the results for the test of Hypothesis 4, which predicts that competitors of restating firms experience lower abnormal announcement returns when they are defined on the 4-digit SIC level, rather than on the 3-digit, or the 2-digit SIC level. Panel A compares 4-digit competitors to 3-digit competitors. Panel B compares 3-digit competitors to 2-digit competitors. Panel C compares 4-digit competitors to 2-digit competitors. The evidence supports Hypothesis 4. For instance, consider mean cumulative announcement returns for competitors during the three days surrounding the restatement announcement, $CAR_{i,-1,+1}$. Panel A shows that for 4-digit competitors, $CAR_{i,-1,+1} = -0.34\%$. For 3-digit competitors, cumulative abnormal returns are lower, at $CAR_{i,-1,+1} = -0.26\%$. The difference in mean cumulative abnormal returns between 4-digit and 3-digit competitors is -0.08% and significant at the 10% level (t-statistic of -1.92).

Table 10 shows that the difference in mean cumulative abnormal returns between SIC levels is highest when 4-digit competitors are compared to 2-digit competitors. Panel C indicates that 4-digit competitors have $CAR_{i,-1,+1} = -0.34\%$ while 2-digit competitors have mean cumulative abnormal returns less than half as high, at $CAR_{i,-1,+1} = -0.17\%$. The difference of -0.17% is statistically significant at the 1% level (t-statistic of 2.62).

Furthermore, Table 10 compares the competitors' investment inefficiency across the various industry levels. As before, investment inefficiency $InvIneff_{k,t-1}$ is measured using the deviation of the marginal q, $MQ_{k,t-1}$, from 1, either in the form of the absolute value $|MQ_{k,t-1} - 1|$, or of the square, $(MQ_{k,t-1} - 1)^2$. The evidence indicates that investment inefficiency is significantly worse at the 4-digit industry level than at the 3-digit and the 2-digit industry level. For example, the results in Panel A show that at the 4-digit industry level, $|MQ_{k,t-1} - 1|$ is on average 0.58, whereas at the 3-digit industry level, $|MQ_{k,t-1} - 1|$ is on average 0.41. The average difference in $|MQ_{k,t-1} - 1|$ between the 4-digit and the 3-digit industry level is -0.16, which is significant at the 1% level (t-statistic of -5.82). Overall, the evidence in Table 10 shows that when the industry definition is tightened from the 2-digit to the 4-digit level, competitors' investment inefficiencies becomes larger, and their cumulative abnormal returns fall, consistent with Hypothesis 4.

5 Alternative explanation

This study argues that competitors experience wealth losses around restatement announcements, because their investments are revealed to have been inefficient, since they were based on erroneous information. The existing literature suggests an alternative explanation, which can potentially account for a part of the negative wealth effect, namely contagion. According to Gleason et al. (2004) and Xu et al. (2006), contagion occurs because a restatement indicates that financial statements in the entire industry are more erroneous than previously thought and the industry may become subject to increased scrutiny from the regulators. The investment inefficiency explanation is different from the contagion explanation, because the investment inefficiency explanation involves competitors' real decisions and not just their financial reporting choices. The contagion explanation focusses solely on competitors' financial reporting.

Nevertheless, it is acknowledged that the contagion effect may explain some of this paper's results. This concern is addressed in various ways. First, this paper tests for a direct link between competitors wealth losses around restatement announcements, and the inefficiency of their past investments. Competitors with more inefficient past investments are found to experience larger wealth losses around the restatement announcement. The alternative contagion explanation does not predict the link between competitors' wealth losses at the restatement announcement, and the inefficiency of their past investments. In fact, there is no reason to expect that competitors pursue inefficient investments ex ante, before the erroneous accounting is revealed through restatements, merely to keep up with restating firms.

Second, the study relies on competitors' corporate governance quality to control for contagion. Firms with inferior corporate governance are more likely to engage in earnings management (Klein, 2002; Leuz et al., 2003), to commit fraud (Dechow et al., 1996; Beasley, 1996; Farber, 1995) and to restate earnings (Agrawal and Chadha, 2005; Kedia and Philippon, 2006). Hence, when a firm announces a restatement, investors may expect that its competitors are more likely to have erroneous financial statements too, and to eventually restate them if their corporate governance is of lower quality. Competitors' abnormal returns at the restatement announcement then are lower as the quality of their corporate governance decreases. It is also possible that the investment inefficiency variable in Table 5 proxies for the quality of corporate governance, since competitors with lower corporate governance quality may invest less efficiently. Furthermore, the market share variable in Table 9 may be related to corporate governance quality. Restating firms may have a larger market share because their competitors have poor governance quality, and therefore do not invest in all optimal and possibly market-share increasing projects.

Corporate governance quality is measured using governance scores from Gompers et al. (2003). The original governance indicators are from the Institutional Investor Research Center (IRCC). IRCC records information on 24 governance anti-takeover provisions that appear to be detrimental to shareholders. The evidence in Table 11 shows that the main results in Table 5 and Table 9 hold after the inclusion of a corporate governance metric for competitors.

Third, the study uses the dispersion of analysts' forecasts to control for the contagion explanation. Restating firms experience negative abnormal returns around the restatement announcement, possibly because the restatement raises investors' uncertainty about the restating firms (Palmrose et al., 2004). Hence if contagion explains competitors' wealth loss and if restatements increase investors' uncertainty, then the uncertainty about competitors should rise around the restatement announcement. Following Palmrose et al. (2004), this study uses the dispersion of analysts' forecasts outstanding at the time of the restatement announcement, and those outstanding 45 days later to capture the change in uncertainty about competitors. Undisplayed evidence indicates that the dispersion of analysts' forecasts for competitors is larger after the restatement announcement, although not significantly so. Furthermore, the findings in Table 11 indicate that the results in this study hold after controlling for the change in the dispersion of analysts' forecasts around the restatement announcement.

Finally, it can be argued that contagion alone cannot explain the results in Table 10. Contagion may play a role because it is likely to be stronger in industries that are more closely defined, since firms in such industries likely have more similar financial reporting practices. To address this concern, Table 10 examines competitors' investment inefficiency across the various industry levels. If contagion alone is driving the differential abnormal returns, there is no a priori reason to expect that investment inefficiency differs across the various industry levels. The evidence shows that investment inefficiency is significantly larger on the 4-digit industry level than on the 3-digit and the 2-digit industry level.

The analysis in this section suggests that the results of this paper are not driven by the contagion effect alone. In fact, both inefficient investment and contagion can contribute to the competitors' wealth loss at the restatement announcement. The purpose of the present study is to draw attention to the investment inefficiency effect, and to show that restatements have an impact that goes beyond financial reporting, and affect real decisions, such as competitors' investments.

6 Sensitivity analysis

This section discusses the sensitivity of the main results to various research settings.

6.1 Econometrics

This study uses industry and year fixed effects to address problems caused by correlated residuals, which are frequent in panel datasets. Fixed effects estimation leads to unbiased standard errors only if the effect does not decay over time (Petersen, 2006). As an alternative to fixed effects estimation, Petersen (2006) suggests using clustered standard errors. Undisplayed evidence shows that the results are qualitatively similar when clustering by industries is used.

Although all regression rely on robust standard errors, heteroskedasticity can still contaminate the results. Since the dependent variable in Tables 5 and 9, $CAR_{k,d-\tau,d+\tau}$, is calculated as the average by industry and fiscal year across all firms, industry-year observations with more firms may have larger variances. To address this issue, the regressions are re-run using the Weighted Least Squares estimation with the weight for each industry-year observation equal to the inverse of the number of firms in the industry-year. The results hold.

Outliers can affect the empirical results. The method proposed by Hadi (1992) is used to detect outliers. In addition, all regressions are re-estimated after winsorizing main variables at the 1 percent and 99 percent levels. Since the market share variable, $MS_{j,t}$, is highly negatively skewed (skewness = 3.33), the regressions in Table 9 is re-run after rank ordering the variable. Furthermore, since some of the cumulative abnormal returns in Tables 5 and 9 are not significant, logit regressions are used, where the dependent variable equals 1 if cumulative abnormal returns $CAR_{k,d-\tau,d+\tau}$ are negative and significant at 10%, and 0 otherwise. These procedures do not change the results.

6.2 Marginal qs

Frictions such as taxes can complicate the estimation of the marginal qs. The threshold level of unity might not reflect optimal investments in the presence of corporate and dividends taxes. Durnev et al. (2004) discuss these issues and show that if average levels of corporate and dividends tax schedules in the U.S. are considered, the value-maximizing level of marginal q would be about 0.8. To capture the effect of taxes, the analysis is redone assuming that the optimal level of marginal q equals 0.75, 0.8, 0.85, and 0.9. The results hold.

Moreover, the value-maximizing level of marginal q may differ across industries and time because financial constraints are not uniform across industries and business conditions may change through time. To address this, it is assumed that every industry, on average, allocates capital efficiently (Ferreira and Laux (2006)). The deviation of firm value from the industry norm is calculated using equation (8) in Appendix B. The squared values of the deviations are used as an alternative measure of investment efficiency. Specifically, the logarithm of the squared values of error terms $\hat{\varepsilon}_{i,t}^{k}$ are aggregated across industries $ln[\Sigma_i \hat{\varepsilon}_{i,t}^{2}/I]$, where I is the number of firms in an industry. The results are robust to this alternative measure of investment efficiency.

To avoid the impact of outliers on estimation of marginal q in (8) in Appendix B, the main analysis drops firms with absolute growth rates in capital stock, $(MV_{i,t} - MV_{i,t-1})/(K_{i,t-1})$, and changes in value (scaled by past capital stock), $(K_{i,t} - K_{i,t-1})/K_{i,t-1}$, greater than 200%. The findings are unchanged if companies with absolute growth rates in capital stock and changes in value greater than 100% or 300% are dropped, or if no firms are dropped at all.

6.3 Other issues

Accounting data for financial and banking industries (SIC 6000-6999) are not widely available. This might affect the regression analysis that rely on accounting-based control variables (in Tables 5, 7, and 9). After dropping these industries (which represents less than 5% of the sample), the results generally become stronger in terms of the statistical significance of the regression coefficients.

The study includes the corporate governance metric developed by Gompers et al. (2003) to control for the contagion effect. Two alternative governance measures are used, namely the governance scores compiled by the Institutional Shareholder Services as in Aggarwal and Williamson (2006), and the S&P's disclosure and transparency rankings, following Durnev and Kim (2004). The results hold.

7 Conclusion

Regulators keep a critical eye on the issue of restatements of published financial statements. The SEC's Advisory Committee on Smaller Public Companies recommended in March 2006 that the SEC provide further guidance regarding restatements for all public companies (SEC, 2006). This interest appears to be driven by concerns of losses in market valuation, as evidenced by Arthur Levitt's statement in 2000 that "countless investors have suffered significant losses as market capitalizations have dropped by billions of dollars due to restatements of audited financial statements." The academic literature generally supports this claim and shows that firms experience significantly negative returns when they announce a restatement. However, these market value losses are limited to a relatively small pool of firms. For instance, Palmrose et al. (2004) find significantly negative mean announcement returns of -9.2% for a sample of 403 firms that restate between 1995 and 1999. For comparison, there are about 14,000 firms on COMPUSTAT during that period. The negative wealth effects of restatements thus appear limited to a small subset of all public firms, which calls into questions the SEC's concern about restatements.

It is shown that restatements of financial statements have wealth-destroying effects that are much more far-reaching than previously thought. The market value losses are not limited to the firms announcing restatements, but also occur for the competitors of these restating firms. This study argues that these wealth losses occur because competitors made inefficient investments in the past, since they relied on financial statements that are revealed to have been erroneous. Consistent with this investment inefficiency hypothesis, competitors are found to have over-invested in the past. Furthermore, the decline in their market value at the restatement announcement is larger when they invested less efficiently. Several additional tests are used to establish that competitors' wealth loss is related to the inefficiency of their past investments. The tests are generally consistent with the investment inefficiency hypothesis.

The evidence in this paper is interesting for several reasons. First, it extends the accounting and finance literature that examines the effect of restatements on the competitors of restating firms. This study is the first to argue and to empirically document that the competitors' wealth losses are related to real inefficiencies that arise due to misallocation of capital by competitor firms. So far, the literature has used contagion to explain why competitors experience wealth losses around restatement announcements. The present paper uses various variables to control for the contagion explanation.

Second, this paper contributes to the recent finance literature that has established a link between information and the quality of capital allocation (Durnev et al., 2004; Ferreira and Laux, 2006). The present paper extends the literature by showing that information deficiencies from one company spill overs to its competitors affecting the quality of investment decisions of the entire industry.

Finally, the findings send a strong message to policymakers and researchers about how to properly evaluate the costs and benefits of governance regulation, including the Sarbanes-Oxley Act. One cannot fully appraise its benefits and costs without taking into account how regulating a firm's corporate governance would affect its competitors. Addressing this issue in the context of the Sarbanes-Oxley Act involves additional data collection on restatements beyond 2002. The authors are investigating this issue in a separate project.

A Variables definition

The subscript j refers to restating firms. Restating firms are obtained from the General Accounting Office study (2002), from 1997 through 2002. The subscript i refers to competitors of restating firms. Competitors are defined either by 4-digit SIC code, by 3-digit SIC code, or by 2-digit SIC code. The subscript k refers to the 4-digit SIC industry of competitors. The subscript m refers to the industry-period m, where the industry is defined by 4-digit SIC code, and the period is from 1996 through 2001. The subscript n refers to the industry-period n, where the industry is defined by 4-digit SIC code, and the period is from 1997 through 2002. The year t is the year when restating companies announce their restatement. The variables are listed in alphabetical order.

- $BH_{j,120}$: Buy-and-hold returns of restating firm j over the 120 days preceding the restatement announcement
- $BH_{k,120}$: Average buy-and-hold returns over the 120 days preceding the restating announcement across all the competitors i in industry k.
- $CAR_{k,d-\tau,d+\tau}$: Market-adjusted returns are cumulated during the time period $d-\tau, d+\tau$ for each competitors i that belongs to the same industry k as restating firm j in the fiscal year t of the restatement announcement on day d. These cumulative abnormal returns are then averaged by competitors in industry k, fiscal year t and announcement day d. The time period $d-\tau, d+\tau$ ranges either from -1 to $+1$, or from -5 to $+5$.
- $Debt_{j,t-1}$: Ratio of long-term debt (COMPUSTAT item #9) to total assets (COMPUSTAT item #6) for restating firm j, $Debt_{j,t-1} = LtD_{j,t-1}/TA_{j,t-1}$.
- $Debt_{k,t-1}$: Ratio of the industry aggregate long-term debt, $LtD_{i,t-1}$, in the competitors' industry k to the industry aggregate total assets in industry k in $t-1$, $Debt_{k,t-1} = \sum_i LtD_{i,t-1}/\sum_i TA_{i,t-1}$.
- $Debt_m$: Ratio of the total market value of long-term debt to total capital stock. Total values are from 1996 through 2001, across all competitors i in the same 4-digit industry k. Market value of long-term debt is defined in Appendix B.
- $\Delta Disp_{k,t}$: Average, by industry k and year t, of the change in the dispersion of analysts' outstanding forecasts between the time of the restatement announcement and 45 days after the restatement announcement. Analysts' forecasts are for the year ahead earnings.

- $Divers_m$: Average, between 1996 and 2001, of industry diversification across all competitor firms i in industry k. Industry diversification is the average number, weighted by total assets, of 4-digit industries in which a competitor firm i operates. Firm segment data come from COMPUSTAT Industry Segment Files.

- $Gov_{k,t}$: Total assets-weighted (in period t) average governance scores across competitors i in industry k. For years 1997 and 1998, the governance indicators are from the 1998 file; for years 1999 and 2000, governance indicators are from the 2000 file, for years 2001 and 2002; governance indicators are from the 2002 file. Governance scores come from Gompers et al. (2003). The original data are from the Institutional Investor Research Center (IRCC).

- $Herf_{k,t-1}$: 4-digit industry Herfindahl index, constructed using sales data (COMPUSTAT item #12).

- $Herf_m$: Average, between 1996 and 2001, of 4-digit industry Herfindahl indices.

- Liq_m: Ratio of the difference between total current assets (COMPUSTAT#4) and total current liabilities (COMUSTAT#5) to total capital stock. Total values are from 1996 through 2001, across all competitors i in the same 4-digit industry k.

- M/B_m: Ratio of the market value of all competitor firms i in the same 4-digit SIC industry k between 1996 and 2001 to their book value. Market and book values are defined in Appendix B.

- $MQ_{k,t-1}$: Marginal q for industry k in year t, estimated between 1996 and 2001, by 4-digit SIC code and by fiscal year t, separately. The estimation procedure is detailed in Appendix B.

- MQ_m: Marginal q for industry m, estimated using pooled data between 1996 and 2001, by 4-digit SIC code. The estimation procedure is detailed in Appendix B.

- $|MQ_{k,t-1} - 1|$: Absolute value of the deviation of the marginal q, $MQ_{k,t-1}$, from 1.

- $(MQ_{k,t-1} - 1)^2$: Square of the deviation of the marginal q, $MQ_{k,t-1}$, from 1.

- $MS_{j,t}$: Market share of restating firm j in industry k in the fiscal year t of the restatement. The market share is the ratio of the restating firms' sales to sales of all the companies in the restating firm's industry k.

- Num_n: Number of restatements during industry-period n (between 1997 and 2002) in industry k.
- $Size_{j,t-1}$: Natural logarithm of total assets of restating firm j at the end of the year prior to the restatement year, $t-1$.
- $Size_{k,t-1}$: Natural logarithm of the sum of total assets at the end of $t-1$, $TA_{i,t-1}$, across all competitors i in industry k, $Size_{k,t-1} = \ln(\sum_i TA_{i,t-1})$.
- $Size_m$: Natural logarithm of capital stock, summed over all competitors i in the same 4-digit industry k, and over the years between 1996 and 2001. Capital stock is defined as in Appendix B.

B Estimation of the marginal q

Following Durnev et al. (2004) and Ferreira and Laux (2006), the inefficiency of investment decisions is measured as the deviation of Tobin's marginal q, $\dot{q}$, from its optimal level. The marginal q is defined as the change in the market value (ΔMV) of the firm due to an unexpected unit increase in its stock of capital goods (ΔK), which is shown to be equal to one plus expected NPV (net present value) of a project scaled by set-up cost C, $\dot{q} = \Delta MV/\Delta K = 1 + E[NPV]/C$.

Since optimal capital budgeting requires investing in all positive expected net present value projects and avoiding all negative expected net present value projects, ignoring taxes and other frictions, the value-maximizing level of investment is equal to 1. Thus, the distance between observed marginal q and unity can serve as a proxy of investment efficiency. The value of q greater (less) than unity would indicate underinvestment (overinvestment). The marginal q for firm i in period t is,

$$\dot{q} = \frac{MV_{i,t} - E[MV_{i,t}]}{K_{i,t} - E[K_{i,t}]} = \frac{MV_{i,t} - MV_{i,t-1}(1 + r_{i,t} - d_{i,t})}{K_{i,t} - K_{i,t-1}(1 + g_{i,t} - \delta_{i,t})}. \tag{5}$$

In (5), $r_{i,t}$ is the expected return from owning the firm, $d_{i,t}$ is the firm's expected disbursement rate (including cash dividends, share repurchases, and interest expenses), $g_{i,t}$ is the expected rate of spending on capital goods, and $\delta_{i,t}$ is the expected depreciation rate on those capital goods. Equation (5) can be rewritten as follows,

$$MV_{i,t} - MV_{i,t-1} = \dot{q}[K_{i,t} - K_{i,t-1}(1 + g_{i,t} - \delta_{i,t})] + MV_{i,t}(r_{i,t} - d_{i,t}), \tag{6}$$

or, after normalizing by $K_{i,t-1}$,

$$\frac{MV_{i,t} - MV_{i,t-1}}{K_{i,t-1}} = \dot{q}(g_{i,t} - \delta_{i,t}) + \dot{q}\frac{K_{i,t} - K_{i,t-1}}{K_{i,t-1}} - m_j \frac{div_{i,t-1}}{K_{i,t-1}} + \frac{MV_{i,t-1}}{K_{i,t-1}}. \tag{7}$$

In (7), $div_{i,t-1}$ is dollar amount of disbursements and m_j is tax wedge. Equation (7) suggests that the marginal q can be measured on an industry-average level by regressing, for all firms i in industry m in year t, the scaled change in firm value, $(MV^k_{i,t} - MV^k_{i,t-1})/K^k_{i,t-1}$, on the growth rate of capital stock, $(K^k_{i,t} - K^k_{i,t-1})/K^k_{i,t-1}$, after controlling for disbursements, $D^k_{i,t-1}/K^k_{i,t-1}$, and the scaled version of market value, $MV^k_{i,t-1}/K^k_{i,t-1}$.

$$\frac{MV^k_{i,t} - MV^k_{i,t-1}}{K^k_{i,t-1}} = \alpha^k + \beta^k_1 \frac{K^k_{i,t} - K^k_{i,t-1}}{K^k_{i,t-1}} + \beta^k_2 \frac{D^k_{i,t-1}}{K_{i,t-1}} + \beta^k_3 \frac{MV^k_{i,t-1}}{K^k_{i,t-1}} + \varepsilon^k_{i,t} \tag{8}$$

The estimated coefficient β^k_1 measures the marginal q in industry k. To determine the individual variables in equation (8), this study follows Durnev et al. (2004) and Morck and Yung (2005). The market value, $MV_{i,t}$ is defined as the sum of market values of outstanding equity and debt, $MV_{i,t} = MV^C_{i,t} + MV^P_{i,t} + MV^{SD}_{i,t} + MV^{LD}_{i,t}$. Variable $MV^C_{i,t}$ is the market value of common stock as given by the price per share (COMPUSTAT #24) times the number of shares outstanding (COMPUSTAT #25); $MV^P_{i,t}$ is market value of preferred shares (net number of preferred shares outstanding in the event of involuntary liquidation multiplied by their per share involuntary liquidating value (COMPUSTAT #10)); and $MV^{SD}_{i,t}$ is market value of short-term debt, which is assumed to be equal to its book value (COMPUSTAT #34). $MV^{LD}_{i,t}$ is the market value of long-term debt. The market value of every vintage of each firm's debt in every year is estimated recursively based on changes in the book values of its debt and assuming all bonds to be 20 year coupon bonds issued at par. Moody's Baa bond rates are used to proxy for all bond yields (see Morck and Yung (2005) for details).

The stock of capital $K_{i,t}$ is defined as the sum of market values of property, plant and equipment and inventories, $K_{i,t} = PPE_{i,t} + INV_{i,t}$. Since historical cost accounting makes simple deflators questionable in adjusting for inflation, a recursive algorithm is used to estimate the value of property, plant and equipment $PPE_{i,t}$.

$$PPE_{i,t} = PPE_{i,t-1} - Dep_{i,t} + \frac{CAPEX_{i,t}}{\prod^t_{\tau=0}(1 + p_\tau)} \tag{9}$$

In (9), $Dep_{i,t}$ is depreciation (COMPUSTAT #14), $CAPEX_{i,t}$ is capital spending (COMPUSTAT #145) and p_τ is the seasonally adjusted producer price index from the U.S. Department of Labor. Equation (9) states that PP&E in year t is PP&E from year $t-1$ minus depreciation plus current capital spending deflated to a base year (chosen to be 1987, that is ten years prior to the beginning of the sample period). For the market value of inventories, the book value is taken for firms using FIFO accounting. For firms using LIFO accounting, a recursive process is used to estimate the age structure of inventories (see Morck and Yung (2005) for details). Inventories are then adjusted for inflation using the GDP deflator.

Variable $D_{i,t}$ in (8) is calculated as the sum of dividends for common shares (COMPUSTAT #21), the value of repurchases of common shares (COMPUSTAT #115), and interest expenses (COMPUSTAT #15).

Firms with absolute growth rates in capital stock, $(MV_{i,t} - MV_{i,t-1})/(K_{i,t-1})$, and changes in value (scaled by past capital stock), $(K_{i,t} - K_{i,t-1})/K_{i,t-1}$, greater than 200% are dropped from estimation of marginal q in (8). At least 10 observations are required to estimate (8). For the analysis in Section 4.1, equation (8) is estimated annually, between 1996 and 2001, across all the firms in the same 4-digit SIC code.

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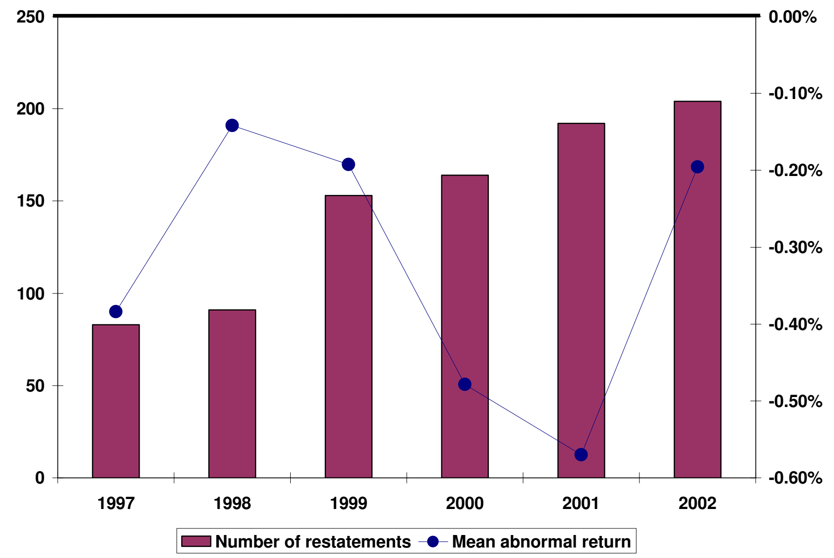
A: Number of restatements and CARs for competitors, by year



B: Cumulative dollar loss for restating companies and their competitors, by year

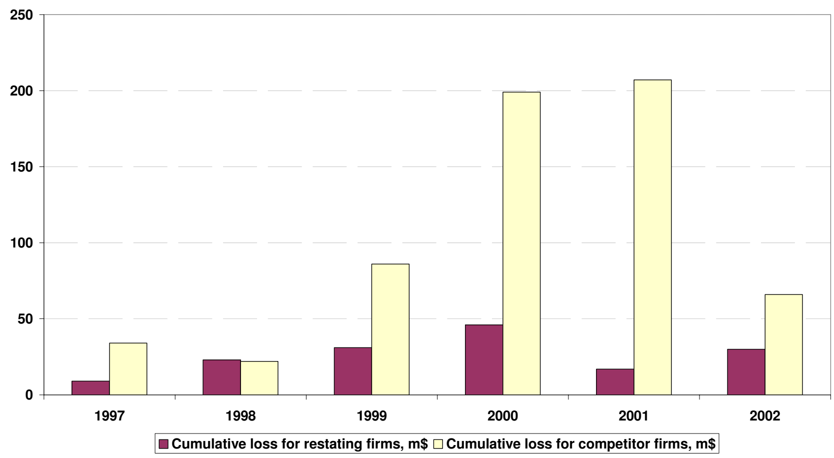


Figure 1: Number of restatements, CARs for competitors and competitors' cumulative dollar loss due to restatements

Figure A plots the number of restatements and the mean cumulative abnormal returns (CARs) during the [-1,+1] event period, for competitors of restating firms by fiscal year. Figure B plots the cumulative dollar loss for restating firms and their competitors, by fiscal year. The cumulative dollar loss is calculated by multiplying the aggregate market value of firms two days before the restatement announcement date with the average cumulative abnormal return during [-1,+1] event period. The number of restatements and the dollar loss for 2002 are multiplied by two because the sample ends in June of 2002.

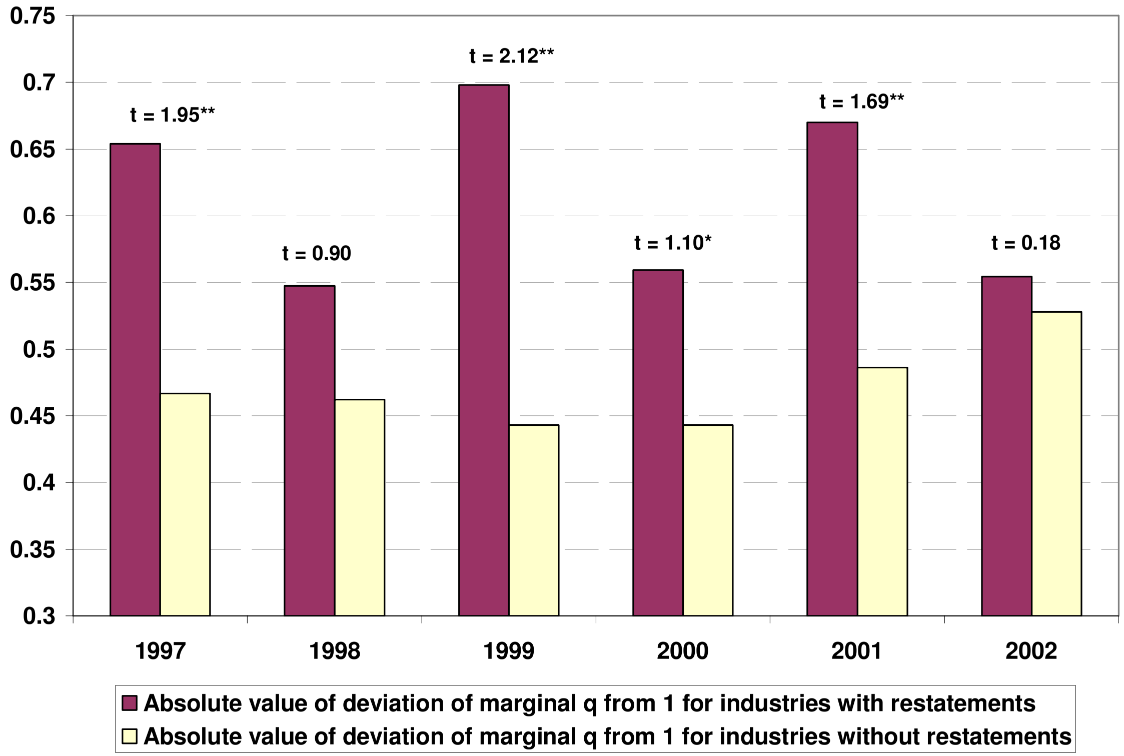


Figure 2: Lagged investment inefficiency (absolute value of the deviation of marginal q from 1) for industries with and without restatements, by year

The length of each bar is group average of the absolute deviation of marginal q from 1. Marginal qs are estimated one year prior to the year of restatements. The numbers above the bars are t-statistics of the means equality tests. *** (**) [*] denotes significance at the 1% (5%) [10%] level.

Table 1: Sample selection, 1997-2002

	Firm-years	Firms
Data on GAO database, 1997 - 2002	916	839
No data on CRSP or COMPUSTAT	(82)	(81)
	836	758
Restatement-years with fiscal year changes	(51)	(13)
Final sample of restatement firms	785	713
Final sample of competitors on the 4-digit SIC level	73,667	8,500
Final sample of competitors on the 3-digit SIC level	153,733	9,425
Final sample of competitors on the 2-digit SIC level	295,574	10,901

This table shows the sample selection details for the competitors of firms that announce a restatement of their financial statements between 1997 and 2002. Restatement firms are obtained from the General Accounting Office study (2002). Competitor firms are defined either by 4-digit SIC code, or by 3-digit SIC code, or by 2-digit SIC code. Numbers in parentheses are observations that are dropped.

Table 2: Mean abnormal returns for competitors (defined on the 4-digit SIC level) of restating firms, around the restatement announcement day ($d = 0$)

Panel A. Daily Abnormal Returns $AR_{k,\tau}$

Day d (1)	Mean Abnormal Return (%) (2)	Number (3)	Positive:Negative (4)	Patell Z (5)	Generalized Sign Z (6)
-10	−0.10%	67,438	29,883:37,545***	-12.036***	-9.447***
-9	−0.17%	67,425	29,811:37,614***	-12.615***	-9.992***
-8	−0.05%	67,427	31,393:36,034**	-4.054***	2.222**
-7	0.12%	67,429	31,612:35,817***	4.350***	3.907***
-6	0.02%	67,430	30,864:36,566**	-2.707**	-1.875**
-5	−0.08%	67,431	30,876:36,555**	-6.269***	-1.786**
-4	−0.05%	67,431	31,196:36,235	-3.650***	0.686
-3	−0.11%	67,432	30,795:36,637***	-8.465***	-2.415***
-2	−0.07%	67,432	31,268:36,164	-2.936***	1.239
-1	−0.18%	67,433	30,924:36,509*	-6.689***	-1.422*
0	−0.08%	67,434	30,960:36,474	-4.571***	-1.148
+1	−0.08%	67,407	31,124:36,283	-3.977***	0.215
+2	0.00%	67,371	30,937:36,434	-2.519**	-1.102
+3	0.04%	67,348	30,901:36,447*	-2.104**	-1.298*
+4	−0.07%	67,310	30,918:36,392	-4.909***	-1.031
+5	−0.11%	67,277	31,324:35,953**	-5.525***	2.226**
+6	−0.01%	67,259	31,494:35,765***	-1.745**	3.606***
+7	−0.01%	67,231	30,824:36,407*	-3.648***	-1.477**
+8	0.04%	67,205	31,238:35,967**	1.080	1.819**
+9	−0.14%	67,174	30,497:36,677***	-9.650***	-3.805***
+10	0.02%	67,145	31,184:35,961*	-2.111**	1.616*

Panel B. Cumulative Abnormal Returns $CAR_{k,d-\tau,d+\tau}$

Time period $[d-\tau, d+\tau]$ (1)	Mean Cumulative Abnormal Return (%) (2)	Number (3)	Positive:Negative (4)	Patell Z (5)	Generalized Sign Z (6)
$[-10, +10]$	−1.08%	67,443	30,451:36,992***	-20.681***	-5.112***
$[-5, +5]$	−0.79%	67,440	30,248:37,192***	-15.563***	-6.669***
$[-3, +3]$	−0.48%	67,439	30,379:37,060***	-11.817***	-5.654***
$[-1, +1]$	−0.34%	67,436	30,754:36,682***	-8.797***	-2.746***
$[-3, 0]$	−0.44%	67,435	30,464:36,971***	-11.330***	-4.983***
$[-1, 0]$	−0.26%	67,434	30,624:36,810***	-7.962***	-3.744***

This table shows the mean abnormal returns around restatement announcements ($d = 0$) for competitors of restatement firms. Mean daily abnormal returns $AR_{k,\tau}$ are presented in Panel A. $AR_{k,\tau}$ are market-adjusted returns for each competitor i that belongs to the same industry k as restating firm j in the fiscal year t of the restatement announcement on day d. Mean cumulative daily abnormal returns $CAR_{k,d-\tau,d+\tau}$ are presented in Panel B. Competitors are defined by 4-digit SIC level and by fiscal year. *** (**) [*] denotes significance at the 1% (5%) [10%] level.

Table 3: Descriptive statistics for restating firms and their competitors, by 4-digit SIC level and year

Variable	Mean	Std. Dev.	Min	Median	Max	#
Panel A. Competitors of restating firms						
$CAR_{k,-1,+1}$	-0.002	0.029	-0.152	-0.001	0.207	773
$CAR_{k,-5,+5}$	-0.002	0.059	-0.278	-0.004	0.340	773
$MQ_{k,t-1}$	0.771	0.724	-2.490	0.710	3.419	478
$\|MQ_{k,t-1} - 1\|$	0.575	0.496	0.000	0.464	3.490	478
$(MQ_{k,t-1} - 1)^2$	0.576	1.189	0.000	0.216	12.18	478
$\Delta Disp_{k,t}$	-0.108	2.503	-20.14	0.0003	17.33	748
$Gov_{k,t}$	9.177	1.762	3.000	9.039	15.000	773
$Herf_{k,t-1}$	0.199	0.157	0.013	0.163	0.968	768
$Size_{k,t-1}$	10.74	2.091	3.431	10.83	16.49	773
$Debt_{k,t-1}$	0.205	12.57	0.014	0.181	0.810	773
$BH_{k,120}$	0.009	0.306	-0.659	-0.025	1.789	773
Num_n	1.737	4.411	0.000	1.000	73.000	445
M/B_m	1.342	0.764	0.138	1.147	5.730	441
$Divers_m$	1.946	0.841	1.000	1.794	5.937	373
$Herf_m$	0.335	0.204	0.016	0.285	0.938	408
$Size_m$	10.996	2.270	2.369	9.979	18.564	441
Liq_m	0.141	0.138	-0.292	0.128	0.628	441
$Debt_m$	0.235	0.123	0.000	0.216	0.666	441
Panel B. Restating firms						
$MS_{j,t}$	0.058	0.120	0.000	0.007	0.984	656
$Size_{j,t-1}$	5.617	2.258	0.372	5.504	13.09	728
$Debt_{j,t-1}$	0.184	0.212	0	0.120	1.66	728
$BH_{j,120}$	-116.7	320.9	-1000	-0.350	3.214	773

This table presents descriptive statistics for restating firms (in Panel B) and their competitors (in Panel A). Competitors belong to the same 4-digit industry k as restating firm j in the fiscal year t of the restatement announcement on day d. The subscript m refers to the industry-period m, where the industry is defined by 4-digit SIC code, and the period is from 1996 to 2001. The subscript n refers to the industry-period n, where the industry is defined by 4-digit SIC code, and the period is from 1997 to 2002. The year t is the year when restating companies announce their restatement. All variables are defined in Appendix A. The computation of marginal qs, $MQ_{k,t-1}$, is detailed in Appendix B. The means of $CAR_{k,-1,+1}$ and $CAR_{k,-5,+5}$ are different from Panel B of Table 2 because the present table reports statistics on industry level.

Table 4: Pearson correlation coefficients for restating firms and their competitors, by 4-digit industry and year

	$CAR_{k,-5,+5}$	$\|MQ_{k,t-1}-1\|$	$(MQ_{k,t-1}-1)^2$	$Gov_{k,t}$	$Herf_{k,t-1}$	$Size_{k,t-1}$	$Debt_{k,t-1}$	$BH_{k,120}$	$MS_{j,t}$	$Size_{j,t-1}$	$Debt_{j,t-1}$	$BH_{j,120}$
$CAR_{k,-1,+1}$	0.48***	-0.05	-0.02	0.07*	-0.06	-0.04	0.02	0.06*	-0.02	0.03	-0.04	-0.04
$CAR_{k,-5,+5}$	1.00	-0.07	-0.07	0.10***	0.11***	-0.09**	0.07*	0.10***	0.04	0.02	-0.02	-0.03
$\|MQ_{k,t-1}-1\|$		1.00	0.91***	-0.05	0.05	0.01	-0.12***	-0.10**	-0.05	0.01	-0.05	0.13***
$(MQ_{k,t-1}-1)^2$			1.00	-0.01	0.07	-0.04	-0.04	-0.11**	0.02	0.04	-0.01	0.11**
$Gov_{k,t}$				1.00	-0.02	-0.01	0.03	0.04	0.05	0.07*	0.03	-0.05
$Herf_{k,t-1}$					1.00	-0.38***	0.06	-0.04	0.31***	-0.08**	-0.02	0.03
$Size_{k,t-1}$						1.00	-0.24***	0.02	-0.35***	0.30***	-0.04	0.00
$Debt_{k,t-1}$							1.00	-0.07*	0.22***	0.15***	0.40***	-0.04
$BH_{k,120}$								1.000	-0.08*	-0.08**	-0.05	0.07*
$MS_{j,t}$									1.00	0.42***	0.15***	0.06
$Size_{j,t-1}$										1.00	0.24***	0.21***
$Debt_{j,t-1}$											1.00	0.01

This table presents the Pearson correlation coefficients for the observations used in the regression displayed in Tables 5 and 9. All variables are defined in Appendix A. *** (**) [*] denotes significance at the 1% (5%) [10%] level. it (3-digit) [4-digit] SIC level when competitors are defined on a 2-digit (3-digit) [4-digit] SIC level too. $Size_{j,t-1}$ is the natural logarithm of assets (COMPUSTAT #6) of restatement firm j at the end of the year prior to the restatement year. $Size_{k,t-1}$ is the natural logarithm of the sum of assets at the end of the year prior to the restatement year across all competitors i in industry k in the fiscal year of the restatement, $Size_{k,t-1} = \sum_i Size_{i,t-1}$. $Debt_{j,t-1}$ is the ratio of long-term debt (COMPUSTAT #9), $LtD_{j,t-1}$, to total assets (COMPUSTAT #6), $TA_{j,t-1}$, for restatement firm j, that is $Debt_{j,t-1} = LtD_{j,t-1}/TA_{j,t-1}$. $Debt_{k,t-1}$ is the ratio of the aggregate long-term debt in the competitors' industry k to the aggregate assets in industry k, that is $Debt_{k,t-1} = \sum_i LtD_{i,t-1}/\sum_i TA_{i,t-1}$. $BH_{j,120}$ are buy-and-hold returns of restating firms over the 120 days preceding the restatement announcement. $BH_{k,120}$ is defined as the average buy-and-hold returns over the 120 days preceding the restatement announcement across all the competitors i in industry k. *** (**) [*] denotes significance at the 1% (5%) [10%] level.

Table 5: Abnormal returns for 4-digit competitors of restating firms, $CAR_{k,d-\tau,d+\tau}$, as a function of investment inefficiency, $InvIneff_{k,t-1}$

$$CAR_{k,d-\tau,d+\tau} = \beta_1 InvIneff_{k,t-1} + \gamma_1 Herf_{k,t-1} + \gamma_2 Size_{k,t-1} + \gamma_3 Debt_{k,t-1} + \gamma_4 BH_{k,120} + \delta_1 Size_{j,t-1} + \delta_2 Debt_{j,t-1} + \delta_3 BH_{j,120} + \sum_{k \in K} I_k + \sum_{t \in [1997,2002]} T_t + \varepsilon_{i,t}$$

Coefficient	Independent Variable	Predicted Sign	$CAR_{k,-1,+1}$ $InvIneff_{k,t-1} =$ $\lvert MQ_{k,t-1}-1\rvert$ (1)	$CAR_{k,-1,+1}$ $InvIneff_{k,t-1} =$ $(MQ_{k,t-1}-1)^2$ (2)	$CAR_{k,-5,+5}$ $InvIneff_{k,t-1} =$ $\lvert MQ_{k,t-1}-1\rvert$ (3)	$CAR_{k,-5,+5}$ $InvIneff_{k,t-1} =$ $(MQ_{k,t-1}-1)^2$ (4)
$\boldsymbol{\beta_1}$	$\mathbf{InvIneff_{k,t-1}}$	**-**	**-0.009****	**-0.002**	**-0.021*****	**-0.009*****
			(-2.16)	**(-1.37)**	**(-2.65)**	**-2.75**
γ_1	$Herf_{k,t-1}$		0.033	0.033	0.16**	0.16**
			(0.92)	(0.91)	(2.24)	(2.23)
γ_2	$Size_{k,t-1}$		-0.017**	-0.016**	-0.036**	-0.035**
			(-2.32)	(-2.17)	(-2.46)	(-2.38)
γ_3	$Debt_{k,t-1}$		-0.80	-0.081	-0.040	-0.044
			(-1.34)	(-1.34)	(-0.34)	(-0.38)
γ_6	$BH_{k,120}$		-0.001	-0.001	0.020**	0.020**
			(-0.36)	(-0.29)	(2.41)	(2.34)
δ_1	$Size_{j,t-1}$		0.001	0.001	0.002	0.002
			(0.73)	(0.78)	(1.07)	(1.07)
δ_2	$Debt_{j,t-1}$		-0.020***	-0.020***	-0.046***	-0.046***
			(-2.64)	(-2.64)	(-3.05)	(-3.05)
δ_3	$BH_{j,120}$		-0.000	-0.000	-0.000	-0.000
			(-0.26)	(-0.50)	(-0.01)	(-0.16)
Four-digit industry dummies I_k			ns	ns	s	s
Year dummies T_t			s	s	s	s
Adjusted R^2			4.4%	3.6%	13.9%	14.0%
# of observations			448	448	448	448

$CAR_{k,d-\tau,d+\tau}$ are calculated as follows. First, market-adjusted returns are summed during the period $[d-\tau, d+\tau]$ for each competitor i that belongs to the same 4-digit industry k as restating firm j in the fiscal year t of the restatement announcement on day $d = 0$. These cumulative abnormal returns are then averaged across all competitors i in industry k and fiscal year t. The period $[d-\tau, d+\tau]$ is either $[-1, +1]$, or $[-5, +5]$. $MQ_{k,t-1}$ is the marginal q for industry k in year $t-1$, estimated between 1996 and 2001, by 4-digit SIC code and year $t-1$. The estimation procedure is detailed in Appendix B. $\lvert MQ_{k,t-1} - 1\rvert$ is the absolute value of the deviation of the marginal q, $MQ_{k,t-1}$, from 1. $(MQ_{k,t-1} - 1)^2$ is the square of the deviation of the marginal q, $MQ_{k,t-1}$, from 1. All other variables are defined in Appendix A. The regression is estimated from 1997 to 2002 in the pooled cross-section with dummies for fiscal years and industries. t-statistics are calculated with robust standard errors. *** (**) [*] denotes significance at the 1% (5%) [10%] level. "s" ("ns") stands for significant (non-significant).

Table 6: Pearson correlation coefficients for industry-period variables

	$\|MQ_m - 1\|$	$(MQ_m - 1)^2$	Num_n	M/B_m	$Divers_m$	$Herf_m$	$Size_m$	Liq_m	$Debt_m$
$\|MQ_m - 1\|$	1.000	0.930***	0.189***	-0.059	-0.058	0.168**	-0.073	0.053	-0.109*
$(MQ_m - 1)^2$		1.000	0.179**	-0.067	-0.039	0.204***	0.013	-0.094	-0.108
Num_n			1.000	0.265***	-0.078	-0.269***	0.346***	0.056	-0.129**
M/B_m				1.000	-0.054	-0.054	-0.064	0.210***	-0.228***
$Divers_m$					1.000	0.090*	0.107*	-0.119**	0.024
$Herf_m$						1.000	-0.449***	-0.037	0.063
$Size_m$							1.000	-0.242***	-0.024
Liq_m								1.000	-0.256***

This table presents the Pearson correlation coefficients for the observations used in the regressions displayed in Tables 7 and 8. The sample includes all industries, that is, industries with and without restatements. All variables are defined in Appendix A. *** (**) [*] denotes significance at the 1% (5%) [10%] level. $(MQ_m - 1)^2$ is the square of the deviation of the marginal q, MQ_m, from 1. Num_m is the number of restatements in industry k between 1997 and 2002. The subscript m is used to denote industry-periods. M/B_m is four-digit industry ratio of the market value of all firms in the same 4-digit SIC code between 1996 and 2001 to their book value. $Divers_m$ is the average, between 1996 and 2001, of industry diversification. Industry diversification is the average, weighted by total assets (COMPUSTAT#6), number of four-digit industries a firm operates in. Firm segment data come from COMPUSTAT Industry Segment Files. $Herf_m$ is the 4-digit industry Herfindahl indexes constructed using sales data, average over the 1996 to 2001 period. $Size_m$ is the natural logarithm of property, plant and equipment (defined in Appendix B) summed over all firms in the same 4-digit industry, and over the years between 1996 through 2001. Liq_m is the ratio of the difference between total current assets and total current liabilities to total tangible assets. $Debt_m$ is the total market value of long-term debt over total tangible assets. Totals are from 1996 through 2001, across all firms in the same 4-digit industry. Tangible assets are defined as in Appendix B. *** (**) [*] denotes significance at the 1% (5%) [10%] level.

Table 7: Investment inefficiency, $InvIneff_m$, as a function of the number of restatements, Num_n

$$InvIneff_m = \delta_1 Num_n + \lambda_1 M/B_m + \lambda_2 Divers_m + \lambda_3 Herf_m + \lambda_4 Size_m + \lambda_5 Liq_m + \lambda_6 Debt_m + \sum_{m \in M} I_m + \varepsilon_m$$

Coefficient	Independent Variable	Predicted Sign	$InvIneff_{m=}$ $\lvert MQ_m - 1\rvert$ (1)	$(MQ_m - 1)^2$ (2)
$\boldsymbol{\delta_1}$	$\mathbf{Num_n}$	+	**0.038*** **	**0.082** **
			(2.78)	**(2.19)**
λ_1	M/B_m		-0.073	-0.212
			(-0.76)	(-0.71)
λ_2	$Divers_m$		-0.050	-0.230
			(-0.66)	(-0.89)
λ_3	$Herf_m$		1.084***	5.132***
			(2.43)	(3.31)
λ_4	$Size_m$		-0.016	0.091
			(-0.31)	(0.50)
λ_5	Liq_m		0.990	2.514
			(1.38)	(1.01)
λ_6	$Debt_m$		-0.685	-2.086
			(-0.99)	(-0.86)
One-digit SIC industry dummies I_m			s	s
Adjusted R^2			6.8%	7.5%
# of observations			224	224

MQ_m is the marginal q, estimated between 1996 and 2001 by 4-digit SIC industry, that is by industry-period m. The estimation procedure is detailed in Appendix B. $\lvert MQ_m - 1\rvert$ is the absolute value of the deviation of the marginal q, MQ_m, from 1. $(MQ_m - 1)^2$ is the square of the deviation of the marginal q, MQ_m, from 1. Num_n is the number of restatements in industry k between 1997 and 2002, that is by industry-period n. All other variables are defined in Appendix A. The regressions are estimated with one-digit SIC dummies. t-statistics are calculated using robust standard errors. *** (**) [*] denotes significance at the 1% (5%) [10%] level."s" ("ns") stands for significant (non-significant).

Table 8: Investment inefficiency, $InvIneff_m$, as a function of the number of restatements, Num_n: overinvestment versus underinvestment

$$\begin{aligned} InvIneff_m &= \delta_0 d_{MQ_m<1} + \delta_1 Num_n + \delta_2 Num_n d_{MQ_m<1} \\ &+\lambda_1 M/B_m + \lambda_2 Divers_m + \lambda_3 Herf_m + \lambda_4 Size_m + \lambda_5 Liq_m + \lambda_6 Debt_m \\ &+\gamma_1 M/B_m d_{MQ_m<1} + \gamma_2 Divers_m d_{MQ_m<1} + \gamma_3 Hirf_m d_{MQ_m<1} \\ &+\gamma_4 Size_m d_{MQ_m<1} + \gamma_5 Liq_m d_{MQ_m<1} + \gamma_6 Debt_m d_{MQ_m<1} + \sum_{m \in M} I_m + \varepsilon_m \end{aligned}$$

Coefficient	Independent Variable	Predicted Sign	$InvIneff_{m=}$ $\lvert MQ_m - 1\rvert$ (1)	$(MQ_m - 1)^2$ (2)
δ_0	$d_{MQ_m<1}$		1.829	3.098
			(1.06)	(0.85)
$\boldsymbol{\delta_1}$	$\mathbf{Num_n}$	+	**0.063****	**0.117***
			(2.03)	**(1.83)**
$\boldsymbol{\delta_2}$	$\mathbf{Num_n d_{MQ_m<1}}$	+	**0.032*****	**0.092****
			(2.19)	**(2.07)**
λ_1	M/B_m		-0.103	-0.259
			(-0.70)	(-0.50)
λ_2	$Divers_m$		0.020	0.231
			(0.17)	(0.56)
λ_3	$Herf_m$		0.882	2.945
			(1.15)	(1.10)
λ_4	$Size_m$		0.090	0.385
			(0.96)	(1.18)
λ_5	Liq_m		0.475	1.002
			(0.43)	(0.26)
λ_6	$Debt_m$		-0.002	1.151
			(-0.01)	(0.04)
γ_1	$M/B_m d_{MQ_m<1}$		0.094	0.109
			(0.52)	(1.06)
γ_2	$Divers_m d_{MQ_m<1}$		-0.075	-0.700
			(0.144)	(-1.39)
γ_3	$Herf_m d_{MQ_m<1}$		0.144	3.254
			(0.15)	(0.99)
γ_4	$Size_m d_{MQ_m<1}$		-0.155	-0.397
			(-1.42)	(-1.04)
γ_5	$Liq_m d_{MQ_m<1}$		0.732	2.150
			(0.56)	(0.48)
γ_6	$Debt_m d_{MQ_m<1}$		-0.745	-2.063
			(-0.52)	(-0.41)
One-digit SIC industry dummies I_m			ns	ns
Adjusted R^2			7.3%	7.8%
# of observations			224	224

MQ_m is the marginal q, estimated between 1996 and 2001 by 4-digit SIC industry, that is by industry-period m. The estimation procedure is detailed in Appendix B. $\lvert MQ_m - 1\rvert$ is the absolute value of the deviation of the marginal q, MQ_m, from 1. $(MQ_m - 1)^2$ is the square of the deviation of the marginal q, MQ_m, from 1. $d_{MQ_m<1}$ is a dummy that equals 1 if the marginal q, MQ_m, is strictly lower than 1, and 0 otherwise. Num_n is the number of restatements in industry k between 1997 and 2002, that is by industry-period n. All other variables are defined in Appendix A. The regressions are estimated with one-digit SIC dummies. t-statistics are calculated using robust standard errors. *** (**) [*] denotes significance at the 1% (5%) [10%] level."s" ("ns") stands for significant (non-significant).

Table 9: Abnormal returns for competitors of restating firms, $CAR_{k,d-\tau,d+\tau}$, as a function of the market share of restating firms, $MS_{j,t}$. Competitors are defined on the 4-digit, the 3-digit, or the 2-digit SIC level.

$$CAR_{k,d-\tau,d+\tau} = \beta_1 MS_{j,t} + \gamma_1 Herf_{k,t-1} + \gamma_2 Size_{k,t-1} + \gamma_3 Debt_{k,t-1} + \gamma_4 BH_{k,120} + \delta_1 Size_{j,t-1} + \delta_2 Debt_{j,t-1} + \delta_3 BH_{j,120} + \sum_{k\in K} I_k + \sum_{t\in[1997,2002]} T_t + \varepsilon_{k,t}$$

Coefficient	Independent Variable	Predicted Sign	$CAR_{k,-1,+1}$ 4-digit SIC (1)	$CAR_{k,-1,+1}$ 3-digit SIC (2)	$CAR_{k,-1,+1}$ 2-digit SIC (3)	$CAR_{k,-5,+5}$ 4-digit SIC (4)	$CAR_{k,-5,+5}$ 3-digit SIC (5)	$CAR_{k,-5,+5}$ 2-digit SIC (6)
β_1	$\mathbf{MS_{j,t}}$	-	**-0.068***** **(-3.08)**	**-0.067***** **(-3.00)**	**-0.010** **(-0.37)**	**-0.107**** **(-2.33)**	**-0.112**** **(-2.42)**	**-0.029** **(-0.50)**
γ_1	$Herf_{k,t-1}$		0.007 (0.30)	0.031 (0.81)	0.161 (1.69)	0.167*** (2.71)	0.087 (0.78)	0.389** (2.03)
γ_2	$Size_{k,t-1}$		-0.005 (-0.73)	-0.003 (-0.48)	-0.003 (-0.49)	-0.027** (-2.11)	-0.030** (-2.07)	-0.014 (-0.97)
γ_3	$Debt_{k,t-1}$		-0.051 (-1.13)	0.031 (0.65)	0.094* (1.92)	-0.058 (-0.62)	0.102 (1.02)	0.134 (1.36)
γ_4	$BH_{k,120}$		0.003 (0.63)	0.004 (0.96)	0.006 (1.47)	0.023*** (2.85)	0.007 (0.83)	0.021*** (2.52)
δ_1	$Size_{j,t-1}$		0.002** (2.45)	0.001** (2.08)	0.001 (1.29)	0.005*** (2.61)	0.003** (1.99)	0.001 (1.11)
δ_2	$Debt_{j,t-1}$		-0.021*** (-2.92)	-0.013* (-1.84)	0.005 (1.10)	-0.041*** (-2.71)	-0.008 (-0.55)	0.015 (1.58)
δ_3	$BH_{j,120}$		-0.000* (-1.67)	-0.001 (-0.15)	0.002 (0.94)	-0.000 (-1.02)	0.009* (1.66)	0.006 (1.62)
Four-digit industry dummies I_k			s	s	ns	s	s	s
Year dummies T_t			ns	ns	ns	s	s	s
Adjusted R^2			14.2%	18.6%	4.7%	15.5%	15.7%	16.3%
# of observations			652	606	606	652	606	606

$CAR_{k,d-\tau,d+\tau}$ are calculated as follows. First, market-adjusted returns are summed during the period $[d-\tau, d+\tau]$ for each competitor i that belongs to the same industry k as restating firm j in the fiscal year t of the restatement announcement on day $d = 0$. These cumulative abnormal returns are then averaged across all competitors i in industry k and fiscal year t. The period $[d-\tau, d+\tau]$ is either $[-1, +1]$, or $[-5, +5]$. $MS_{j,t}$ is the market share of restating firm j in t. The industry is defined on a 2-digit (3-digit) [4-digit] SIC level when competitors are defined on a 2-digit (3-digit) [4-digit] SIC level. All other variables are defined in Appendix A. t-statistics are calculated using robust standard errors. The regression is estimated from 1997 to 2002 in the pooled cross-section with dummies for fiscal years and 4-digit SIC industries. *** (**) [*] denotes significance at the 1% (5%) [10%] level."s" ("ns") stands for significant (non-significant).

Table 10: Mean cumulative abnormal returns and mean investment inefficiency for competitors of restating firms, for various definitions of competitors

Time period $[d-\tau, d+\tau]$	Mean		Difference	DF
	(1)	(2)	(3) = (2) - (1)	(4)
A. 4-digit versus 3-digit competitors				
	4-digit competitors	3-digit competitors		
$CAR_{k,d-1,d+1}$	−0.34%	−0.26%	−0.08%*	2,300
			(−1.92)	
$CAR_{k,d-5,d+5}$	−0.79%	−0.56%	−0.23%***	2,301
			(−2.83)	
$CAR_{k,d-10,d+10}$	−1.08%	−0.71%	−0.37%***	2,308
			(−3.07)	
$\|MQ_{k,t-1} - 1\|$	0.58	0.41	−0.16***	1,076
			(−5.82)	
$(MQ_{k,t-1} - 1)^2$	0.58	0.34	−0.24***	1,076
			(−3.61)	
B. 3-digit versus 2-digit competitors				
	3-digit competitors	2-digit competitors		
$CAR_{k,d-1,d+1}$	−0.26%	−0.17%	−0.09%**	2,280
			(−1.94)	
$CAR_{k,d-5,d+5}$	−0.56%	−0.23%	−0.33%***	2,287
			(−2.98)	
$CAR_{k,d-10,d+10}$	−0.71%	−0.27%	−0.44%***	2,817
			(−3.12)	
$\|MQ_{k,t-1} - 1\|$	0.41	0.28	−0.13***	1,306
			(−7.63)	
$(MQ_{k,t-1} - 1)^2$	0.34	0.12	−0.22***	1,306
			(−5.94)	
C. 4-digit versus 2-digit competitors				
	4-digit competitors	2-digit competitors		
$CAR_{k,d-1,d+1}$	−0.34%	−0.17%	−0.17%***	2,271
			(−2.62)	
$CAR_{k,d-5,d+5}$	−0.79%	−0.23%	−0.56%***	2,270
			(−3.20)	
$CAR_{k,d-10,d+10}$	−1.08%	−0.27%	−0.81%***	2,263
			(−3.47)	
$\|MQ_{k,t-1} - 1\|$	0.58	0.28	−0.30***	1,184
			(−14.13)	
$(MQ_{k,t-1} - 1)^2$	0.58	0.12	−0.46***	1,184
			(−9.97)	

This table compares the mean cumulative abnormal returns ($CAR_{k,d-\tau,d+\tau}$) and mean investment inefficiency ($|MQ_{k,t-1} - 1|$ or $(MQ_{k,t-1} - 1)^2$) of competitors over the interval $[d-\tau, d+\tau]$ across various SIC levels, that is the 4-digit SIC level, the 3-digit SIC level and the 2-digit SIC level. The unpaired means comparison test is used. $CAR_{k,d-\tau,d+\tau}$ are market-adjusted returns cumulated over the period $[d-\tau, d+\tau]$ for each competitor i that belongs to the same industry k as restating firm j in the fiscal year t of the restatement announcement on day d. $MQ_{k,t-1}$ is the marginal q for industry k in year $t-1$, estimated between 1996 and 2001, by four-digit SIC code and by year $t-1$. The estimation procedure is detailed in Appendix B. DF denotes Degrees of Freedom. t-statistics are shown in parentheses. *** (**) [*] denotes significance at the 1% (5%) [10%] level.

Table 11: Controlling for the contagion explanation using the quality of governance, $Gov_{k,t}$, and the change in the dispersion of analysts' forecasts, $\Delta Disp_{k,t}$.

Panel A. Abnormal returns for 4-digit SIC competitors of restating firms, $CAR_{k,d-\tau,d+\tau}$, as a function of investment inefficiency, $InvIneff_{k,t-1}$

$$CAR_{k,d-\tau,d+\tau} = \beta_1 InvIneff_{k,t-1} + \eta_1 Gov_{k,t} + \eta_2 \Delta Disp_{k,t} + \gamma_1 Herf_{k,t-1} + \gamma_2 Size_{k,t-1} + \gamma_3 Debt_{k,t-1} + \gamma_4 BH_{k,120} + \delta_1 Size_{j,t-1} + \delta_2 Debt_{j,t-1} + \delta_3 BH_{j,120} + \sum_{k \in K} I_k + \sum_{t \in [1997,2002]} T_t + \varepsilon_{k,t}$$

Coefficient	Independent Variable	Predicted Sign	$CAR_{k,-1,+1}$ $InvIneff_{k,t-1} =$ $\lvert MQ_{k,t-1}-1\rvert$ (1)	$(MQ_{k,t-1}-1)^2$ (2)	$CAR_{k,-5,+5}$ $InvIneff_{k,t-1} =$ $\lvert MQ_{k,t-1}-1\rvert$ (3)	$(MQ_{k,t-1}-1)^2$ (4)
$\boldsymbol{\beta_1}$	$\mathbf{InvIneff_{k,t-1}}$	**-**	**-0.009****	**-0.002**	**-0.021*****	**-0.009*****
			(-2.35)	**(-1.49)**	**(-2.68)**	**-2.77**
η_1	$Gov_{k,t}$		0.001	0.001	0.000	0.001
			(0.33)	(0.37)	(0.05)	(0.11)
η_2	$\Delta Disp_{k,t}$		0.001	0.000	0.001	0.001
			(1.14)	(0.99)	(0.59)	(0.48)
Adjusted R^2			5.3%	4.4%	13.5%	13.7%
# of observations			446	446	446	446

Panel B. Abnormal returns for competitors of restating firms, $CAR_{k,d-\tau,d+\tau}$, as a function of the market share of restating firms, $MS_{j,t}$. Competitors are defined on the 4-digit, the 3-digit, or the 2-digit SIC level.

$$CAR_{k,d-\tau,d+\tau} = \beta_1 MS_{j,t} + \eta_1 Gov_{k,t} + \eta_2 \Delta Disp_{k,t} + \gamma_1 Herf_{k,t-1} + \gamma_2 Size_{k,t-1} + \gamma_3 Debt_{k,t-1} + \gamma_4 BH_{k,120} + \delta_1 Size_{j,t-1} + \delta_2 Debt_{j,t-1} + \delta_3 BH_{j,120} + \sum_{k \in K} I_k + \sum_{t \in [1997,2002]} T_t + \varepsilon_{k,t}$$

Coefficient	Independent Variable	Predicted Sign	$CAR_{k,-1,+1}$ 4-digit SIC (1)	3-digit SIC (2)	2-digit SIC (3)	$CAR_{k,-5,+5}$ 4-digit SIC (4)	3-digit SIC (5)	2-digit SIC (6)
β_1	$\mathbf{MS_{j,t}}$	**-**	**-0.092*****	**-0.092*****	**-0.078**	**-0.153*****	**-0.177*****	**-0.217****
			(-3.72)	**(-3.61)**	**(-1.55)**	**(-3.07)**	**(-3.35)**	**(-2.15)**
η_1	$Gov_{k,t}$		0.001	0.001	0.001	0.005	0.005	0.002
			(0.42)	(0.27)	(1.50)	(1.26)	(1.37)	(1.60)
η_2	$\Delta Disp_{k,t}$		0.000	0.000	0.001	0.0003*	0.000	0.001**
			(0.58)	(0.51)	(1.82)	(0.61)	(0.80)	(2.54)
Adjusted R^2			12.5%	17.8%	4.7%	16.0%	17.2%	17.8%
# of observations			621	588	606	621	588	593

This table controls for the contagion explanation using the quality of industry corporate governance, $Gov_{k,t}$, and the change in the dispersion of analysts' forecasts, $\Delta Disp_{k,t}$. Panel A [Panel B] shows the results from adding $Gov_{k,t}$ and $\Delta Disp_{k,t}$ to the vector of independent variables in Table 5 [Table 9]. $Gov_{k,t}$ is the total assets-weighted (in period t) average governance scores across competitors i in industry k. $\Delta Disp_{k,t}$ is the average, by industry k and year t, of the change in the dispersion of analysts' forecasts outstanding between the time of the restatement announcement and 45 days after the restatement announcement. Analysts' forecasts are for the year ahead earnings. All other variables are defined as in Table 5 and Table 9, and are further described in Appendix A. Only β_1, η_1 and η_2 are displayed. t-statistics are calculated using robust standard errors. The regression is estimated from 1997 to 2002 in the pooled cross-section with dummies for fiscal years and 4-digit SIC industries. *** (**) [*] denotes significance at the 1% (5%) [10%] level. "s" ("ns") stands for significant (non-significant).